LONGITUDINAL BALANCE REQUIREMENT FOR DIGITAL SERVICES

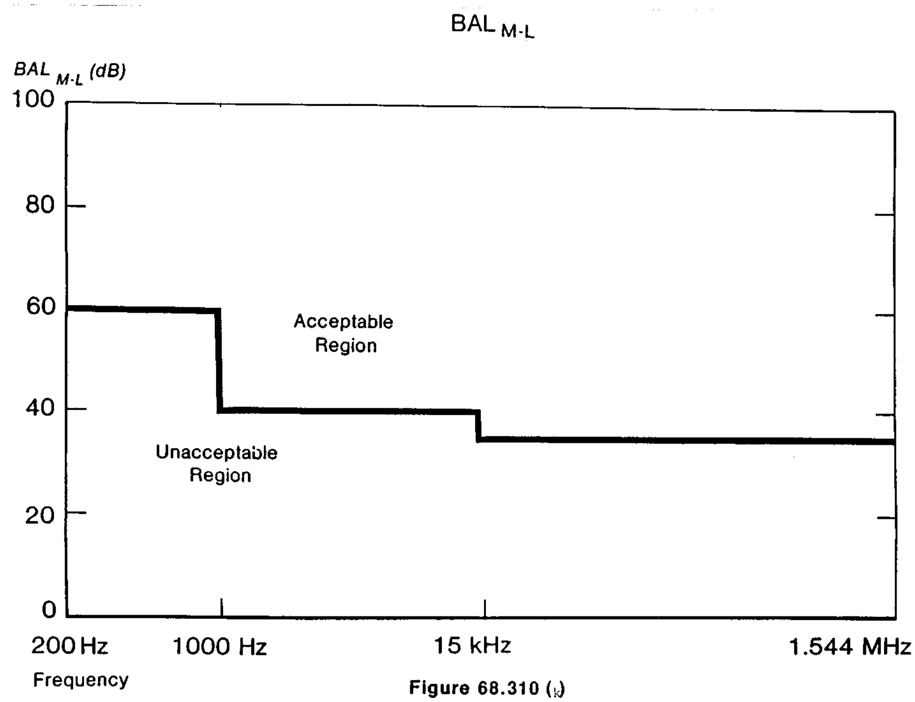

Figure 68.310 (k)

[45 FR 20853, Mar. 31, 1980, as amended at 45 FR 54343, Aug. 15, 1980; 45 FR 61632, Sept. 17, 1980; 47 FR 39687, Sept. 9, 1982; 49 FR 48724, Dec. 14, 1984; 51 FR 950, Jan. 9, 1986; 51 FR 16690, May 6, 1986; 61 FR 42393, Aug. 15, 1996]

§ 68.312 On-hook impedance limitations.

(a) *General.* The limitations in this section that involve 2-wire network ports apply to tip and ring of the public switched network. For 4-wire network ports (tip, ring, tip 1, and ring 1) with loop-start or ground-start signaling, the limitations apply when tip and ring conductors are connected together and treated as one of the conductors of a tip and ring pair and the tip 1 and ring 1 conductors are connected together and treated as the other conductor of a tip and ring pair.

(b) Limitations on individual equipment intended for operation on loop-start telephone facilities, including PSDS Type II in the analog mode:

(1) Registered terminal equipment and registered protective circuitry shall conform to the following limitations, for each Ringing Type which is listed as part of its Ringer Equivalence:

(i) The dc resistance between tip and ring conductors, and between each of the tip and ring conductors and earth ground, shall be greater than 5 megohms for all dc voltages up to and including 100 volts.

(ii) The dc resistance between tip and ring conductors, and between each of the tip and ring conductors and earth ground shall be greater than 30 kilohms for all dc voltages between 100 and 200 volts.

(iii) During the application of simulated ringing, as listed in table I below, the total dc current, shall not exceed 3.0 milliamperes.

(iv) During the application of simulated ringing, as listed in table I below, the impedance between the tip and ring conductors (defined as the quotient of applied ac voltage divided by resulting true rms current) shall be greater than the value specified in table I. Except as provided in paragraph (b)(2) of this section, such impedance shall be less than 40 kilohms.

(v) During the application of simulated ringing, as listed in table I below, the impedance between each of the tip and ring conductors and ground shall be greater than 100 kilohms.

(2) Registered terminal equipment and registered protective circuitry intended for use on facilities which will always have ringing detection circuitry in use at the same time such registered terminal equipment and registered protective circuitry is connected need not comply with the 40 kilohms maximum impedance specification of paragraph (b)(1)(v) of this section.

(c) *Limitations on individual equipment intended for operation on ground-start telephone facilities.* Registered terminal equipment and registered protective circuitry shall conform to the following limitations for each Ringing Type which is listed as part of its Ringer Equivalence Number:

(1) During the application of simulated ringing, as listed in table I below, the total dc current flowing between tip and ring conductors shall not exceed 3.0 milliamperes.

(2) During the application of simulated ringing, as listed in table I below, the total impedance of the parallel combination of the ac impedance across tip and ring conductors and the ac impedance from the ring conductor to ground (with ground on the tip conductor) shall be greater than the value specified in table I. Except as provided in paragraph (b)(2) of this section, such impedance shall be less the 40 kilohms.

(d) *Ringer equivalence definition.* The values of each of the parameters for which a limitation is imposed in paragraph (b) or (c) of this section, as appropriate, shall be determined for a representative unit under test. Quotients of each such value shall be formed according to the following:

(1) For individual equipment intended for operation on loop-start telephone facilities:

(i) 25 megohms divided by the minimum measured on-hook dc resistance for all dc voltages up to and including 100 volts.

(ii) 150 kilohms divided by the minimum measured on-hook dc resistance for all dc voltages between 100 and 200 volts.

(iii) The maximum total dc current flowing between tip and ring during the application of simulated ringing as listed in table I below, in milliamperes, divided by 0.6 milliamperes.

(iv) Five times the impedance limitation listed in table I, below, divided by the minimum measured ac impedance, defined as in paragraph (b)(1)(iv) of this section, during the application of simulated ringing as listed in table I.

(2) For individual equipment intended for operation on ground-start telephone facilities:

(i) The maximum total dc current flowing between tip and ring conductors during the application of simulated ringing as listed in table I below, in milliamperes, divided by 0.6 milliamperes.

(ii) Five times the impedance limitation listed in table I below divided by the minimum measured ac impedance, defined in paragraph (b)(2) of this section, during the application of simulated ringing as listed in table I.

The largest of the unitless quotients so formed, followed by the Ringing Type letter indicator representing the frequency range for which that number is valid, is the Ringer Equivalence. If Ringer Equivalence is to be stated for more than one Ringing Type, testing shall be performed at each frequency range to which Ringer Equivalence is to be determined in accordance with the above, and the largest resulting Ringer Equivalence number so determined will be associated with each Ringing Type letter designation for which it is valid.

(e) Registered terminal equipment and registered protective circuitry shall have at least one ringer equivalence number shown on the registration label. Where options that will vary the ringer equivalence are involved, either each option that results in a ringer equivalence number greater than 0.1 and its corresponding Ringer Equivalence shall be listed on the registration label, or the largest ringer equivalence number that can result from such options shall be stated on the label. A trained, authorized agent of the Grantee may disconnect ringers, bridge ringers to another line, or execute options affecting ringer equivalence after the telephone company has been notified in accordance with § 68.106.

(f) All registered terminal equipment and registered protective circuitry which can affect on-hook impedance shall be assigned a Ringer Equivalence. The sum of all such ringer equivalences on a given telephone line or loop shall not exceed 5; in some cases, a system which has a total ringer equivalence of 5 or less may not be usable on a given telephone line or loop.

(g) *Ringing type Z equipment.* Equipment which has on-hook impedance characteristics which do not conform to the requirements of this section may be conditionally registered, notwithstanding the requirements of this section, provided that it is labelled with a Ringing Type designation ''Z''. It should be noted that registration of equipment bearing the designation ''Z'' does *not* necessarily confer any right of connection to the telephone network under these rules; any equipment registered with the type Z designation may only be used with the consent of the local telephone company, provided that the local telephone company does not discriminate in its treatment of equipment bearing the type Z designation.

(h) Limitations on PBX equipment with an off-premises interface and direct inward dialing (DID). PBX ringing supplies whose output appears on the off-premises interface leads shall not trip when connected to the following tip-to-ring impedance which terminates the off-premises station loop:

Ringing frequency Hz	ac impedance ohms	
	Class B, or C	Class A
20±3	$\frac{7000}{N}$	1400
30±3	$\frac{5000}{N}$	1000

N—Number of ringer equivalences, as specified by the manufacturer, which can be connected to the off-premises station loop.

(i) Limitations on individual equipment intended for operation with message register signaling channels:

(1) Registered terminal equipment and registered protective circuitry shall conform to the following limitations in all operating states.

(2) The dc resistance between each of the tip (*MR*) and ring (*MR*) conductors and ground shall be greater than 30 kilohms for voltages up to and including 200 volts.

(j) Limitations on individual equipment ports with ringdown or inband signaling or voiceband metallic channels for connection to voiceband private line interfaces.

(1) Registered terminal equipment and registered protective circuitry with 2-wire ports for ringdown, inband signaling or voiceband metallic channels shall provide a dc resistance between tip and ring conductors and between each of the tip and ring conductors and earth ground greater than 30 kilohms for all dc voltages up to and including 200 volts.

(2) Registered terminal equipment and registered protective circuitry with 4-wire ports for ringdown, inband signaling or voiceband metallic channels shall provide a dc resistance between each of the tip, ring, tip 1 and ring 1 conductors and earth ground greater than 30 kilohms for all dc voltages up to and including 200 volts.

(k) Registered terminal equipment and registered protective circuitry shall not by design leave the on-hook state by operations performed on tip and ring leads for any other purpose than to request service or answer an incoming call, except that terminal equipment which the user places in the off-hook state for the purpose of manually placing telephone numbers in internal memory for subsequent automatic or repertory dialing shall be registrable. Make-busy indications shall be transmitted by the use of make-busy leads only as defined in §§ 68.3 and 68.200(j).

TABLE I

Ringing type	Range of compatible ringing frequencies Hz	Simulated ringing voltage superimposed 56.5 volts dc	Impedance limitation (ohms)
A	20 ± 3	40 to 130 volts rms	1400
	30 ± 3	40 to 130 volts rms	1000
B	15.3 to 68.0	40 to 150 volts rms	1600
C	15.3 to 17.4	54 to 120 volts rms	1600
D	19.3 to 20.7[1] (frequency-selective).	54 to 120 volts rms	1600
E	24.3 to 25.7	54 to 120 volts rms	1600
F	29.3 to 30.7[1] (frequency-selective).	54 to 120 volts rms	1600
G	32.6 to 34.0	54 to 130 volts rms	1600
H	39.2 to 40.9	62 to 130 volts rms	1600
J	41.0 to 43.0	62 to 130 volts rms	1600
K	49.0 to 51.0	62 to 140 volts rms	1600
L	52.9 to 55.1	62 to 140 volts rms	1600
M	58.8 to 61.2	68 to 150 volts rms	1600
N	65.4 to 68.0	68 to 150 volts rms	1600
P	15.3 to 34.0	54 to 130 volts rms	1600
Q	20 ± 3	40 to 130 volts rms	1400

[1] NOTE: Requirements at these frequencies, which are identical to Type A frequencies, are not consistent with the Type A requirements; equipment intended for use both on Type A facilities and facilities using frequency-selective ringing must comply with the requirements on Types A, D and F independently.

[45 FR 20853, Mar. 31, 1980, as amended at 45 FR 61632, Sept. 17, 1980; 45 FR 79486, Dec. 1, 1980; 46 FR 40192, Aug. 7, 1981; 48 FR 34044, July 27, 1983; 51 FR 950, Jan. 9, 1986; 51 FR 28237, Aug. 6, 1986; 61 FR 42394, Aug. 15, 1996; 61 FR 47434, Sept. 9, 1996]

§ 68.314 Billing protection.

(a) *Call duration requirements on data equipment connected to the public switched network, or to tie trunks, or to private lines that access the public switched network.* Registered data terminal equipment and registered protective circuitry shall comply with the following requirements when answering an incoming call, except in off-hook states in which the signals are transmitted and/or received by electroacoustic transducers only:

NOTE: This paragraph (a) will be applicable to terminal equipment and registered protective circuitry employed with digital services where such digital services are interconnected with the analog telephone network.

(1) *Registered protective circuitry.* Registered protective circuitry connected to associated data equipment shall assure that the following signal power limitations are met for at least 2 seconds after the off-hook condition is presented to the telephone network in response to an incoming call:

(i) Signals that appear at the protective circuitry/telephone network interface for delivery to the telephone network shall be limited to −55 dB with respect to one milliwatt as such signals are delivered into a loop simulator circuit or a 600 ohm termination, as appropriate; and

(ii) Signals that appear at the protective circuitry-associated data equipment interface for delivery to associated data equipment shall be limited as follows: for any received signal power (appearing at the protective circuitry-telephone network interface) up to 0 dB with respect to one milliwatt (at any frequency in the range of 200 to 3200 Hertz), the power of signals delivered to associated data equipment shall be no greater than the signal power that would be delivered as a result of received signal power of −55 dB with respect to one milliwatt.

(2) *Registered terminal equipment.* Registered terminal equipment for data applications shall assure that, when an incoming telephone call is answered, the answering terminal equipment prevents both transmission and reception of data for at least 2 seconds after the answering terminal equipment transfers to the off-hook condition. For the purpose of this requirement, a fixed sequence of signals that is transmitted (and originated within) and/or received by the registered terminal equipment each time it answers an incoming call shall not be considered data, provided that such signals are for one or more of the following purposes:

(i) Disabling echo control devices,

(ii) Adjusting automatic equalizers and gain controls,

(iii) Establishing synchronization, or

(iv) Signaling the presence and if required, the mode of operation, of the data terminal at the remote end of a connection.

(b) *Voice and data equipment on-hook signal requirements for equipment connected to the public switched network, or*